CLAIMS

1. A linear motor (10) comprising a stator (411) and an actuator, the stator (411) being fed by a controlled voltage (V_M), the controlled voltage (V_M) being applied to the linear motor (10) and adjusted by a processing unit (22) by means of a variable frequency inverter,

- the linear motor (10) moving a load from the actuator displacement, the linear motor (10) forming a resonant assembly with the load, the resonant assembly having a resonance frequency,

the linear motor (10) being characterized in that the processing unit (22) is configured to control a displacement range of the actuator by means of the controlled voltage (V_M),

the processing unit (22) selectively increasing or decreasing the displacement range in a proportional manner to the variations of the resonance frequency throughout the load variations and to dynamically keep the resonant assembly in resonance.

2. A linear compressor (100) applicable to a cooling system (20), the linear compressor (100) comprising a piston (1) driven by a linear motor (10), the piston (10) having a displacement range controlled by a controlled electric voltage (V_M), the controlled electric voltage (V_M) having a voltage frequency (F_{VM}) applied to the linear motor (10) and adjusted by a processing unit (22),

the linear compressor (100) being characterized in that the processing unit (22) is configured to dynamically control the range of piston (1) displacement as a function of the variable demand of the cooling system (20), the linear compressor (100) having a resonance frequency,

the processing unit (22) adjusting the range of piston displacement so that the linear compressor (100) will be dynamically kept in resonance throughout the variations in demand of the cooling system, the control of the pistons displacement being made by means of the controlled voltage (V_M) that is adjusted by means of a variable frequency inverter, the inverter dynamically adjusting the voltage frequency (f_{VM}) of the controlled voltage (V_M) to a value equal to the value of the resonance frequency of the linear

compressor (100), as the variations in demand of the cooling system (20) occur.

3. A linear compressor according to claim 2, characterized in that the controlled voltage (V_M) generates a feed current (i_A) that circulates in the linear motor (10),

the processing unit (22) measuring a feed phase (ϕ_C) of the feed current (i_A) and the dynamic phase (ϕ_P) of the piston (1) of the linear compressor (100),

the processing unit (22) measuring the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P) and establishing a measured phase (ϕ_{PC}), the processing unit (22) adjusting the controlled voltage (V_M) so that the value of the measured phase (ϕ_{PC}) will be null.

4. A linear compressor according to claim 3, characterized in that the controlled voltage (V_M) is decreased when the value of measured phase (ϕ_{PC}) is positive and increased quant the measured phase (ϕ_{PC}) is negative.

5. A linear compressor according to claim 4, characterized in that the feed phase (ϕ_C) is obtained from a pre-defined moment of the feed current (i_A).

6. A linear compressor according to claim 5, characterized in that the pre-defined moment of the feed current (i_A) is the passage of the feed current (i_A) by zero.

7. A linear compressor according to claim 6, characterized on that the pre-defined moment is obtained at the middle point of the permanence of the feed current (i_A) at zero.

8. A linear compressor according to claim 7, characterized in that the dynamic phase (ϕ_P) is obtained from a signal of piston (1) displacement (DP).

9. A linear compressor according to claim 8, characterized in that the value of the dynamic phase (ϕ_P) is obtained by means of a displacement sensor (30) electrically associated to the processing unit (22).

10. A linear compressor according to claim 9, characterized in that the value of the dynamic phase (ϕ_P) is obtained from the position of pis-

ton (1) displacement (DP).

11. A method of controlling a linear compressor (100), the linear compressor (100) comprising a piston (1) driven by a linear motor (10), the linear motor (10) being fed by a controlled voltage (V_M) having a voltage frequency (F_{VP}) of the linear motor (10) and generating a capacity of the linear compressor (100),

the method being characterized in that it comprises the following steps of:

measuring the feed frequency (f_{VP}) of the linear motor (10) and compensating the feed frequency (f_{VP}) by comparing the measurement with a reference frequency (FR) and

increasing the capacity of the linear compressor (100) if the voltage frequency (f_{VP}) is higher than the reference frequency (FR), or

decreasing the capacity of the linear compressor (100) if the voltage frequency (f_{VP}) is lower than the reference frequency (FR).

12. A method according to claim 11, characterized in that, after the step of increasing or decreasing the capacity of the linear compressor (100), there is a step of waiting the passage of a stabilization time.

13. A method according to claim 12, characterized in that, after the passage of the stabilization time, the feed frequency of the linear motor (100) is measured again.

14. A method of controlling a linear compressor (100), the linear compressor (100) comprising a piston (1) driven by a linear motor (10),

the piston (1) having a controlled voltage (V_M), the controlled voltage (V_M) having a voltage frequency (f_{VM}) applied to the linear motor (10) and adjusted by a processing unit (22),

controlled voltage (V_M) generating a feed current (i_A) that circulates in the linear motor (10),

the method being characterized by comprising the steps of:

- measuring a feed phase (ϕ_C) of the feed current (i_A) and a dynamic phase (ϕ_C) of the piston (1) of the linear compressor (100), and

- measuring the difference between the feed phase (ϕ_C) and the

dynamic (ϕ_P) and establishing a measured phase (ϕ_{PC}),

- dynamically adjusting the range of displacement in function of a variation in demand of the linear compressor (100), so that the linear compressor will be kept in resonance throughout the variations in demand of the cooling system (20) so that the value of the measured phase (ϕ_{PC}) will be null.

15. A method according to claim 14, characterized in that, after the step of establishing the measured phase (ϕ_{PC}), there is a step of increasing the range of piston (1) displacement when the value of the measured phase (ϕ_{PC}) is positive or a step of decreasing the range of piston (1) displacement when the value of the measured phase (ϕ_{PC}) is negative.

16. A method according to claim 15, characterized in that, after the step of increasing or decreasing the range of piston (1) displacement, it is foreseen to await the passage of a stabilization time.

17. A method according to claim 16, characterized in that, after the passage of the stabilization time, there is a new measurement of the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P).

18. A cooling system (20) comprising a linear compressor (100), the cooling system (20) comprising an on/off thermostat actuating the linear compressor (100),

a linear compressor (100) comprising a piston (1) driven by a linear motor (10)

a piston (1) having a displacement range controlled by means of a controlled voltage (V_M), the controlled voltage (V_M) having a voltage frequency (f_{MV}) applied to the linear motor (10) and adjusted by a processing unit (22),

the cooling system (20) being characterized in that:

the range of piston (1) displacement is dynamically controlled in junction of a variable demand of the cooling system (20) during the period when the thermostat turns on the linear compressor (100),

the linear compressor (100) having a resonance frequency, the processing unit adjusting the range of piston (1) displacement so that the lin-

ear compressor (100) will be dynamically kept in resonance throughout the variations in demand of the cooling system (20),

the displacement being adjusted through the controlled voltage (V_M) by means of a variable frequency inverter, the inverter dynamically adjusting the voltage frequency of the controlled voltage (V_M) to a value equal to the resonance frequency of the linear compressor (100), as the variations in demand of the cooling system (20) occur.

19. A linear compressor (100) controlling system, the system being characterized by comprising a processing unit (20) measuring a range of piston (1) displacement and the processing unit adjusting the range of the piston (1) displacement to dynamically keep the linear compressor (100) in resonance throughout the variations in demand of the cooling system (20), the control central being configured to measure a feed phase (ϕ_C) of a feed current (i_A) and a dynamic phase (ϕ_P) of the piston (1) of the linear compressor (100),

the processing unit (22) measuring the difference between the feed phase (ϕ_C) and the dynamic phase (ϕ_P) and establishing a measured phase (ϕ_{PC}), the processing unit (22) adjusting the controlled voltage (V_M) so that the value of the measured phase (ϕ_{PC}) will be null.

the displacement being adjusted through the controlled voltage (V_M) by means of a variable frequency inverter, the inverter dynamically adjusting the voltage frequency of the controlled voltage (V_M) to a value equal to the resonance frequency of the linear compressor (100), as the variations in demand of the cooling system (20) occur.